

CLAIMS

Sub B 1) A method intended for thermal insulation, characterized in that a volume defined by the space contained between a first enclosure interior to a second enclosure is filled with vegetable foam particles.

5 2) A method as claimed in claim 1, wherein said volume is an annular space defined by the outside of a pipe placed in another pipe.

Sub B 3) A method as claimed in any one of the previous claims, wherein said volume of vegetable foam is solubilized by an aqueous fluid so as to allow free pulling of said internal enclosure.

10 *Sub B* 4) A method as claimed in claim 3, wherein said fluid is about 1N soda.

5) A method as claimed in any one of the previous claims, wherein the average size of the particles is below 5 mm.

Sub B 6) A method as claimed in any one of the previous claims, wherein said vegetable foam comprises at least : a flour and/or a non-gelatinized starch, a plasticizer, possibly
15 another additive, a water content below 10 % and preferably below 5 %.

Sub B 7) An installation consisting of a first enclosure placed in a second enclosure, characterized in that the space contained between said enclosures comprises a volume of vegetable foam particles used as a thermal insulant.

8) An installation as claimed in claim 7, wherein said enclosures consist of a string of tubings intended for transportation of a petroleum effluent placed in another pipe, a well for example.

9) An installation as claimed in any one of claims 7 to 8, wherein said vegetable
5 foam particles have the following properties : thermal conductivity ranging between 0.03 and 0.06 W/m.°K and at least partial solubility in an aqueous fluid.

10) An installation as claimed in any one of claims 7 to 9, wherein said vegetable foam particles comprise at least : a flour and/or a non-gelatinized starch, a plasticizer, possibly another additive, a water content below 10 % and preferably below 5 %.

10 11) An installation as claimed in any one of claims 7 to 10, wherein said space further comprises at least one of the following insulants : silicate foam particles, aerogel foam particles, dry powders.

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12) A vegetable foam characterized in that it consists of at least a flour and/or at least a non-gelatinized starch, one or more plasticizers and possibly one or more
15 additives, and the water content is below 10 %, preferably of the order of 5 %.

13) A vegetable foam characterized in that it consists of at least a flour, one or more plasticizers and possibly one or more additives, and the water content is below 10 %, preferably of the order of 5 %.

14) A vegetable foam characterized in that it consists of at least a non-gelatinized
20 starch, one or more plasticizers and possibly one or more additives, and the water content is below 10 %, preferably of the order of 5 %.

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15) A vegetable foam characterized by the following properties:

- thermal conductivity ranging between 0.03 and 0.06 W/m.°K
- solubility in an aqueous fluid.

16) A process for preparing a vegetable foam, characterized in that it consists in :

- 5 - mixing a flour and/or starch with one or more plasticizers, and possibly one or more additives;
- heating the mixture,
- expanding the mixture so as to obtain a foam whose water content is below 10 %, preferably of the order of 5 %.

10 17) A process for preparing a vegetable foam as claimed in claim 16, characterized in that the parameters relative to baking-extrusion on BC 45 are :

- Material flow rate (kg/h) : 1 to 200,
- % water added : 0 to 10,
- Temperature (°C) : 20 to 300,
- 15 - Screw speed (rpm) : 5 to 600.

18) A process for preparing a vegetable foam as claimed in any one of claims 16 or 17, characterized in that the plasticizer used is glycerol whose incorporation percentage ranges from 1 to 60 %, preferably from 10 to 40 % by weight.

19) A process for preparing a vegetable foam as claimed in any one of claims 16 to 20 18, characterized in that the additives are pigments, fungicides, sugars, structuring

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agents, expanding agents, cellulose fibres, alcohols, whose incorporation percentage ranges from 0 to 99 %, preferably from 0 to 30 % by weight.

- 20) A process for preparing a vegetable foam as claimed in any one of claims 16 to 19, characterized in that mixing, heating and expansion consist of baking-two-screw or
5 single-screw extrusion at temperatures ranging between 10°C and 300°C, preferably between 20°C and 250°C.

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